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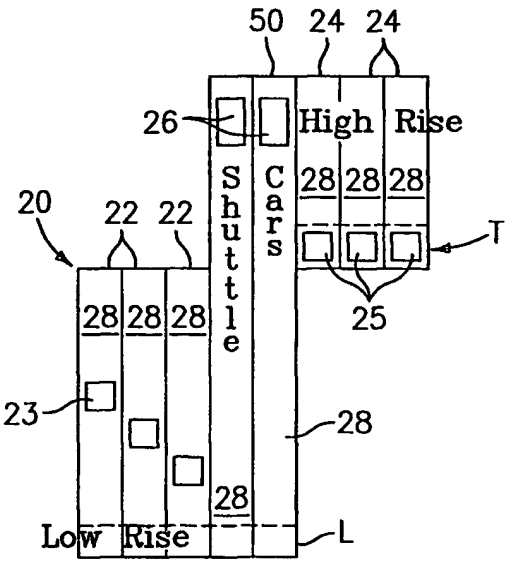
(54) Title: CORE SPACE SAVING THROUGH INTERGROUP COMMUNICATION



(57) Abstract: The present invention relates to an elevator system which increases the rentable space in a building. The elevator system has a first bank (22) of elevator cars (23) for servicing a first set of floors, such as low rise floors, from a lobby L, a second bank (24) of elevator cars (25) for servicing a second set of floors, such as high rise floors, but not from the lobby, and at least one shuttle car (26) for moving people between the lobby and at least one of the second set of floors.

WO 2004/058616 A1

CORE SPACE SAVING THROUGH INTERGROUP COMMUNICATION

BACKGROUND OF THE INVENTION

The present invention relates to an elevator system which decreases the amount of hoistway space required to move people through a building and provides the building owner with more rentable space.

Building owners are always looking for ways to increase the amount of rentable space in their building without sacrificing the quality of building services. In a standard elevatoring convention, as shown in FIG. 1, a building 10 is divided into low rise banks 12 and high rise banks 14 having an express zone 16. Each bank 12 and 14 has a certain number of cars and all cars, for each group in the building, reach the lobby to allow entry and exit of passengers. As a result, a lot of hoistway core space is utilized for elevators instead of for customer rental space.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an elevator system which decreases the amount of hoistway space required to move people through a building and gives the building owner more rentable space.

The foregoing object is achieved by the elevator system of the present invention.

An elevator system in accordance with the present invention broadly comprises a first bank of elevator cars for servicing a first set of floors from a lobby, a second bank of elevator cars for servicing a second set of floors but not from said lobby, and at least one shuttle car for moving people between said lobby and at least one of said second set of floors.

Other details of the elevator system of the present invention, as well as other objects and advantages attendant thereto, are set forth in the following detailed description and the accompanying drawings wherein like reference numerals depict like elements.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation of a conventional approach for moving people through a building;

FIG. 2 is a schematic representation of a first embodiment of an elevator system in accordance with the present invention;

FIG. 3 is a schematic representation of a second embodiment of an elevator system in accordance with the present invention;

FIG. 4 is a schematic representation of a third embodiment of an elevator system in accordance with the present invention;

FIG. 5 is a schematic representation of a fourth embodiment of an elevator system in accordance with the present invention; and

FIG. 6 is a schematic representation of a fifth embodiment of an elevator system in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Referring now to the drawings, FIG. 2 illustrates an elevator system 20 in accordance with the present invention. In this system, there is a first bank or low rise bank 22 of elevator cars 23 which service the lobby L and lower floors in the building and a second bank or high rise bank 24 of elevator cars 25 which service higher floors in the building but not the lobby L. There is also shuttle cars 26 which move people from one rise of the building to another. The shuttle cars 26 move people from the bank of elevators in one rise to the bank of elevators in the other rise so that all hoistways 28 do not need to reach the lobby L. In accordance with the present invention, the core space savings result from the fact that although there may be the same number of hoistways 28 as in a conventional system, some of the hoistways 28 are shorter, resulting in less overall hoistway space used to move the same number of people throughout the same building.

As an example, consider a building with two banks of elevators of four cars each. One bank 22 serves the lobby L and

the low rise floors and one bank 24 serves the high rise floors. Conventionally, all eight hoistways 28 would reach the lobby and passengers travelling to the high rise would move through an express zone from the lobby to the bottom of the high rise as shown in FIG. 1. In the system 20, at least two cars, depending on the building population and traffic patterns, will be used as shuttle cars 26 to move people from and to the high rise. Additionally, there will be configurable transfer floor(s) T within the high rise. As shown in FIG. 2, the shuttle cars 26 have hoistways 28 which extend from the lobby L to the top 50 of the building. The other cars in the banks 22 and 24 will only have hoistways extending the distance of the portion of the building it serves. With the efficient use of the shuttle cars 26, the hoistway space normally used to allow all cars in the high rise bank to travel to the lobby can be used instead for rentable space. The only cars requiring full size hoistways are the shuttle cars 26 themselves.

The shuttle cars 26 can be designed to have an increased capacity to handle traffic as compared to the other cars in the banks 22 and 24. This can be accomplished by using bigger cars for the shuttle cars 26, by increasing the size of the shuttle cars 26, by using faster shuttle cars 26, by using double deck shuttle cars, or by some combination of these attributes. By increasing the shuttle car capacity, the system can insure adequate throughput of passengers from the lobby L to and from the high bank 24 of elevator cars.

The present invention will operate optimally to minimize passenger travel time when the low rise elevator bank 22 and the high rise elevator bank 24 are able to communicate with each other. This may be done using a wide variety of communication medium including, but not limited to, Ethernet, CAN, LonWork and RS 485/422. Thus, when a hall call is registered at the lobby L for a high rise floor, both the low rise group and the high rise group are immediately aware of the call. It should be noted,

however, that absent such communication, the present invention will still function and decrease hoistway space.

During up peak, most passengers are arriving at the lobby L and want to travel up to their destination floor. That floor might be either a low rise floor or a high rise floor. Both banks 22 and 24 of elevators will be notified when a new hall call is entered at the lobby for a high rise floor. The dispatchers will take into account the amount of time it will take that passenger to arrive at the transfer floor T for the high rise and will schedule a car to be waiting for the passenger there. The elevator controllers will detect the demand and determine how long it will take each elevator car to respond to the demand and will pick the best one to serve the demand. This is done by knowing the status of each elevator including present demand, speed and position. In this way, a shuttle car will be selected to serve the demand from the lobby L and another car will be waiting for the passenger at the transfer floor T for the passenger to board. If some type of destination entry is used for entering calls at the lobby or elsewhere, then the high rise dispatcher will automatically include the upcoming car call in its calculations and the hall call will be automatically transferred to the car assigned to the call.

Since the high rise dispatcher will have a car at the transfer floor T to pick up passengers transferring to the lobby L, there will be no change in passenger waiting time as compared with conventional systems. The service time will be impacted by the amount of time needed to actually transfer from the shuttle car to the car specifically serving the high rise. This added time may be mitigated by the fact that the shuttle car 26 is faster than the other cars. Although it is possible that under some circumstances, the shuttle car 26 may bring people directly to their destination floor, usually the shuttle car 26 will bring people to the transfer floor T requiring them to move from one car to another to get to their final destination.

The present invention is well suited to be used in conjunction with the channeling feature, if desired. The low rise bank 22 of elevators may operate channeling in the traditional fashion, while the shuttle cars 26 move people to the high rise. Similarly, channeling sectoring can be applied to the high rise bank 24 of elevators. The high rise sector assignments can be displayed at the lobby so that passengers know in advance which elevator car they need to board in order to get to their final destination. The shuttle car(s) 26 may communicate with the high rise elevator bank 24 to make sure that the appropriate cars are available as people arrive at the transfer floor T.

FIGS. 3 - 5 illustrate elevator systems where the shuttle cars 26 can serve either or both banks 22 and 24, depending on the traffic demands of each bank. For example, in the system of FIG. 3, during business traffic, five hoistways 28 reach the lobby L with one of the shuttle cars 26 serving as a low rise car and the other of the shuttle cars 26 servings as a high rise car. In the system of FIG. 4, five hoistways 28 reach the lobby L and both shuttle cars 26 serve as low rise cars. In the system of FIG. 5, five hoistways 28 reach the lobby and both shuttle cars 26 serve as high rise cars.

In the systems of FIGS. 3 - 5, the times of day that the elevators would serve in this fashion is configurable. Overall system performance can be improved over conventional methods because the shuttle cars can swing from one bank to the other as needed. If the building population is medium to low, then only one car may be needed to shuttle all the ways from the top to the bottom of the building and the second car can shuttle just between the low rise and the high rise.

Each transfer floor T may have openings to both banks 22 and 24 of elevators or to only one bank 22 or 24 depending on which floor(s) the shuttle cars are configured to stop at. The shuttle cars 26 may be configured to stop at the highest floor of the low rise and the lowest floor of the high rise or to only

one of these floors depending on the needs of the building. Similarly, this applies if there are multiple transfer floors.

During down peak transfer times, when most people are traveling to the lobby, and two way traffic times, when most of the building traffic is either to or from the lobby, the shuttle cars 26 and the intergroup communication approach described herein, may be used to facilitate certain conditions. Whenever a passenger at the lobby has a destination of a high rise floor, whenever a passenger in the high rise has a lobby destination, or whenever a passenger in one bank of elevators wants to travel to the other bank, the shuttle cars 26 will come into use. In these situations, the dispatchers will take into account the amount of time it will take a passenger to arrive at a transfer floor for the opposite rise and will schedule a car to be waiting for the passenger there. If some type of destination entry is used for entering calls at the lobby or elsewhere then the dispatcher will automatically include the future car call for that rise in its calculations. The hall call with destination entry will be automatically transferred to the car assigned to that call.

In certain buildings, it may be useful to install separate risers to be used whenever a passenger wants to travel to the lobby L. This provides helpful information to the dispatcher during two way and down peak traffic times, and enables the dispatcher to make better car assignments.

Referring now to FIG. 6, the idea of using shuttle cars 26 and intergroup communication to save hoistway space can be expanded to any number of elevator banks. For example, the building may have a low rise bank 22 of elevator cars 23, a high rise bank 24 of elevator cars 25, a mid rise bank 30 of elevator cars 31, and three shuttle cars 26. The hoistways 28 for the shuttle cars 26 and the low rise bank can reach the lobby L. The shuttle cars 26 can be configured to stop at any combination of rises. For example, the shuttle cars 26 may act to shuttle people between rises during up-peak, down-peak and two-way

traffic. During the rest of the day traffic, the shuttle cars 26 may be used to serve local traffic within a rise. The present invention allows the shuttle cars to operate as local cars as well during all different type modes to help improve traffic handling performance.

The elevator systems of the present invention offer customers acceptable dispatching performance while saving core space over traditional approaches. In addition, the present invention offers improved traffic handling during two way traffic due to the ability to use certain cars in one group or another as needed through the use of intergroup communication.

It is apparent that there has been provided in accordance with the present invention an elevator system which fully satisfies the objects, means and advantages set forth hereinbefore. While the present invention has been described in the context of specific embodiments thereof, other alternatives, modifications, and variations will become apparent to those skilled in the art having read the foregoing description. Accordingly, it is intended to embrace those alternatives, modifications, and variations which fall within the broad scope of the appended claims.

WHAT IS CLAIMED IS:

1. An elevator system for a building comprising:

a first bank of elevator cars for servicing a first set of floors from a lobby;

a second bank of elevator cars for servicing a second set of floors but not from said lobby; and

at least one shuttle car for moving people between said lobby and at least one of said second set of floors.

2. An elevator system according to claim 1, wherein said at least one shuttle car travels in a first hoistway which extends from said lobby to a top of said building, said first bank of elevator cars each travel in a second hoistway, said second bank of elevator cars each travel in a third hoistway, and said second and third hoistways each being shorter in length than said first hoistway so as to increase the rentable space in said building.

3. An elevator system according to claim 1, wherein each said at least one shuttle car is larger in capacity than each of said elevator cars in said first and second banks.

4. An elevator system according to claim 1, wherein each said at least one shuttle car comprises a double deck shuttle car.

5. An elevator system according to claim 1, wherein each said at least one shuttle car travels faster than said elevator cars in said first and second banks.

6. An elevator system according to claim 1, further comprising:

said second set of floors being a set of high rise floors;

means for notifying both said first and second banks of elevator cars when a hall call is registered at said lobby for one of said high rise floors; and

means for moving an elevator car in said second bank so that said elevator car in said second bank arrives at a transfer floor at a particular time after said new call has been entered.

7. An elevator system according to claim 1, wherein said at least one shuttle car services at least one of said first and second set of floors during regular business traffic.

8. An elevator system according to claim 1, further comprising a transfer floor having an opening to at least one of said first and second banks.

9. An elevator system according to claim 1, wherein said at least one shuttle car serves as a first bank elevator car during business traffic.

10. An elevator system according to claim 1, wherein said at least one shuttle car serves as a second bank elevator car during business traffic.

11. An elevator system according to claim 1, further comprising a third bank of elevator cars for servicing a third set of floors, said third bank of elevator cars operating in hoistways which do not reach said lobby, and said at least one shuttle car travels from said lobby and services said second and third set of floors.

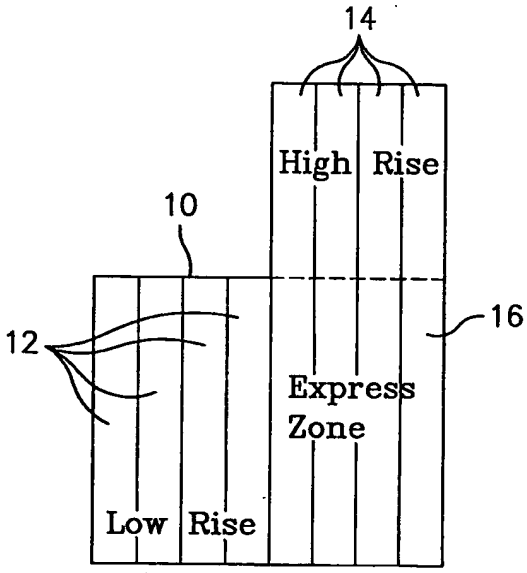


FIG. 1
(PRIOR ART)

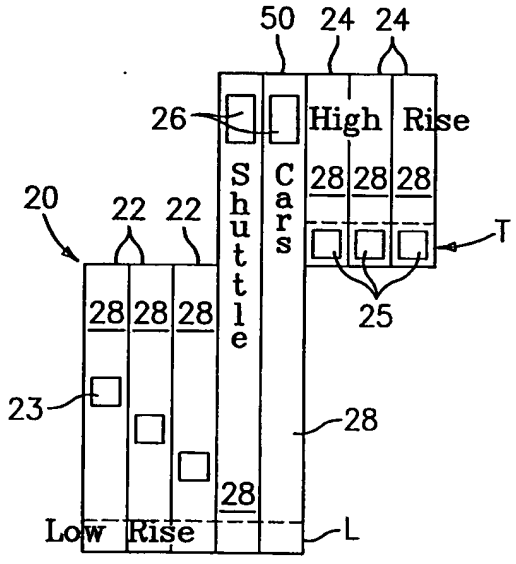


FIG. 2

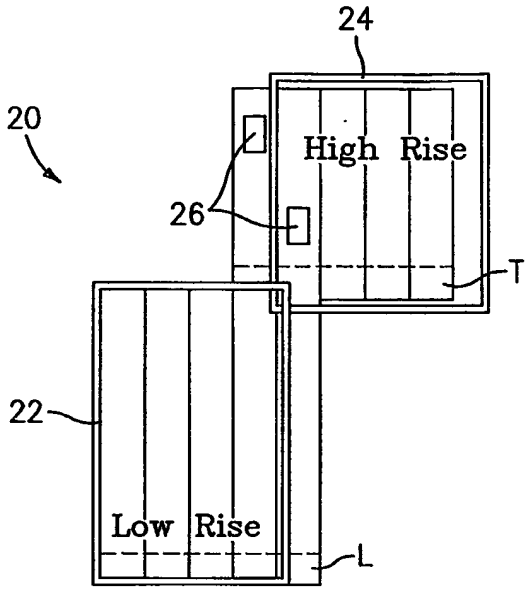


FIG. 3

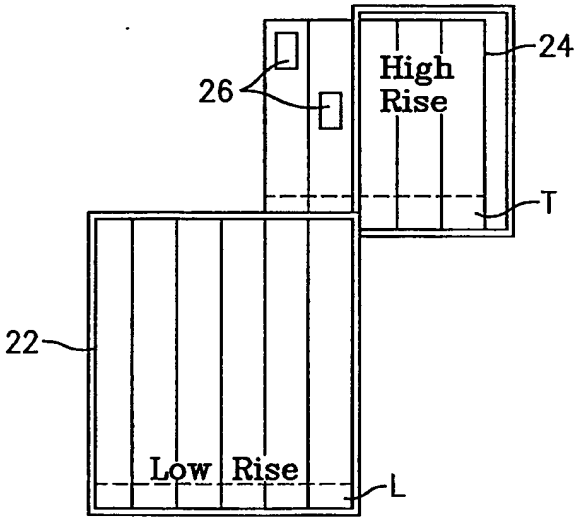


FIG. 4

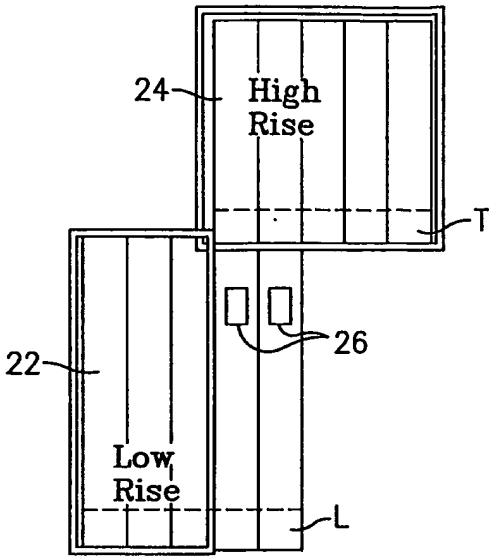

24
High
Rise
T
26
22
Low
Rise
L

FIG. 5

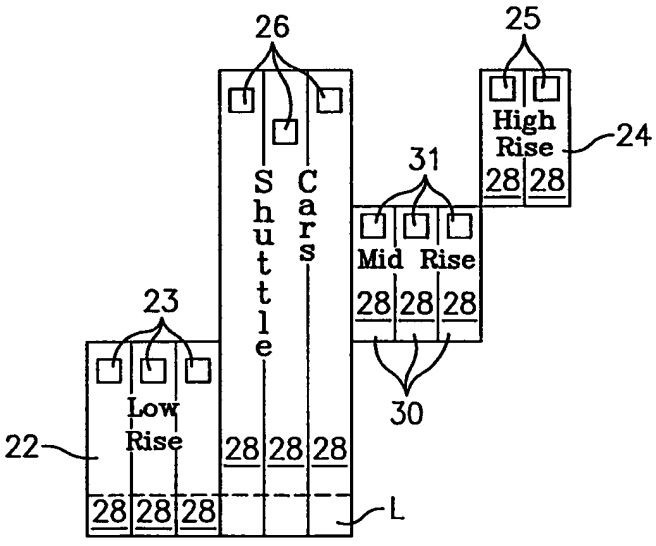

26
25
Shuttle Cars
High
Rise
24
28 28
31
Mid Rise
28 28 28
23
Low
Rise
22
28 28 28
30
28 28 28
L

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/41514

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : B66B 1/20

US CL : 187/383, 395

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 187/383, 395, 380, 381, 382, 249

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

USPTO APS EAST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,969,304 A (BARKER et al) 19 Octeober 1999 (19.10.1999), see entire document.	1, 2, 7-11
Y		3-6
Y	US 5,823,299 A (WIERSCHKE et al) 20 October 1998 (20.10.1998), see entire document.	3-6
Y	US 5,663,538 A (SAKITA) 02 September 1997 (02.09.1997), see entire document.	1-11
Y	US 6,065,570 A (FRIEDLI et al) 23 May 2000 (23.05.2000), see figures 3, 5.	1-11
Y	US 3,750,849 A (BERKOVITZ) 07 August 1973 (07.08.1973), see figure 3.	1-11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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